

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference INTEU/P31704PC	<b>FOR FURTHER ACTION</b>	See item 4 below
International application No. PCT/GB2004/005463	International filing date ( <i>day/month/year</i> ) 31 December 2004 (31.12.2004)	Priority date ( <i>day/month/year</i> ) 31 December 2003 (31.12.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant INTELLIGENT ENERGY LIMITED		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 <i>bis</i> .1(a).																								
2.	This REPORT consists of a total of 9 sheets, including this cover sheet.  In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	<p>This report contains indications relating to the following items:</p> <table style="width: 100%;"> <tr> <td style="width: 10%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 30%;">Box No. I</td> <td style="width: 80%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input checked="" type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																							
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).																								

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Date of issuance of this report <b>03 July 2006 (03.07.2006)</b>  Authorized officer <div style="text-align: center; font-weight: bold; font-size: 1.2em;">Nora Lindner</div>
Facsimile No. +41 22 338 82 70	e-mail: pt02@wipo.int

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:     <p style="text-align: center;">see form PCT/ISA/220</p>	<div style="text-align: right; font-weight: bold; font-size: 1.2em;">PCT</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px; text-align: center;">                         REC'D 14 MAR 2006                          WIPO PCT                     </div> <p style="text-align: center; font-weight: bold;">WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)</p> <div style="border: 1px solid black; padding: 2px; margin-top: 10px;">                         Date of mailing                          (day/month/year) see form PCT/ISA/210 (second sheet)                     </div>
Applicant's or agent's file reference see form PCT/ISA/220	<b>FOR FURTHER ACTION</b> See paragraph 2 below
International application No. PCT/GB2004/005463	International filing date (day/month/year) 31.12.2004
Priority date (day/month/year) 31.12.2003	
International Patent Classification (IPC) or both national classification and IPC H01M8/04, H01M8/02	
Applicant INTELLIGENT ENERGY LIMITED	

**1. This opinion contains indications relating to the following items:**

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

**2. FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

**3. For further details, see notes to Form PCT/ISA/220.**

Name and mailing address of the ISA:  <div style="display: flex; align-items: center;"> <div>                         European Patent Office - P.B. 5818 Patentlaan 2                          NL-2280 HV Rijswijk - Pays Bas                          Tel. +31 70 340 - 2040 Tx: 31 651 epo nl                          Fax: +31 70 340 - 3016                     </div> </div>	Authorized Officer  Reich, C  Telephone No. +31 70 340-4396
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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/GB2004/005463

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material:  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing:  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

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The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
- ☒ claims Nos. 28,29

because:

- ☐ the said international application, or the said claims Nos.      relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos.      are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the whole application or for said claims Nos. 28,29
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
  - the written form                      ☐ has not been furnished
  - ☐ does not comply with the standard
  - the computer readable form      ☐ has not been furnished
  - ☐ does not comply with the standard
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☐ See separate sheet for further details

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/GB2004/005463

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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	5-8,13,14,20,27
	No: Claims	1-4,9-12,15-19,21-26
Inventive step (IS)	Yes: Claims	
	No: Claims	1-27
Industrial applicability (IA)	Yes: Claims	1-27
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

Claims 28 and 29 have not been searched under the provisions of Article 17(2)(b) PCT since these claims contain references to the drawings and since these claims are therefore so unclear that no meaningful search and examination is possible.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1) Reference is made to the following documents:

- D1: WO 00/63992 A
- D2: US 2002/102448 A1
- D3: US-B1-6 376 111
- D4: DE 100 36 916 A1
- D5: DE 25 33 215 A1
- D6: US 2003/186093 A1

**2) CLARITY:**

2.1) The application does not meet the requirements of Article 6 PCT, because claims 1, 4, 9-12, 15-17 and 20-26 are not clear.

2.2) Claims 1, 15-17 and 22-26 do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The claims attempt to define the subject-matter in terms of the result to be achieved

"delivering a sufficient quantity of liquid water to the fluid flow channels within the cathode such that a relative humidity of 100 % is maintained throughout the fluid flow channels"

"to ensure that there is more liquid water at all regions of the cathode surfaces of all cells than can be evaporated in the prevailing temperature and pressure conditions"

"to maintain delivery of a (specific) "water factor" for all fuel cell or fuel cell stack currents within a normal operating range",

which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

2.3) The term "substantially" used in claims 1 and 17 is vague and unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claims unclear.

2.4) Claims 4, 9-12, 22-26 do not meet the requirements of Article 6 PCT in that these claims employ the unusual parameter "water factor" that does not allow a meaningful comparison with the prior art.

2.5) Some of the features in the apparatus claims 20-26 relate to a method of using the apparatus rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear from these claims, contrary to the requirements of Article 6 PCT.

**3) NOVELTY:**

3.1) The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-4, 9-12 and 15-19 and 21-26 is not new in the sense of Article 33(2) PCT (for claims 1, 4, 9-12, 15-17 and 20-26 see also CLARITY (2)).

3.2) Document D1 (claim 1; examples 1,5; fig. 2) discloses:

A method of operating an electrochemical fuel cell having an anode, an ion transfer membrane and a cathode, comprising the steps of:

- delivering fluid fuel to fluid flow channels within the anode;
- delivering fluid oxidant to fluid flow channels within the cathode;
- exhausting reaction by-products and any unused oxidant from the fluid flow channels within the cathode; and
- determining a maximum in cell voltage as a function of liquid water flow rate and delivering at least a minimum water flow rate corresponding to said cell voltage maximum.

Document D1 further discloses an electrochemical fuel cell assembly comprising:

- at least one anode fluid flow field plate having fluid flow channels therein;
- at least one ion transfer membrane;
- at least one cathode fluid flow field plate having fluid flow channels therein;
- means for delivering fluid fuel to the anode fluid flow channels;
- means for delivering fluid oxidant to the cathode fluid flow channels;
- a water injection means for delivering liquid water to the fluid flow channels within the cathode;
- in which the water injection means comprise a pump and a controller and in which the controller includes a voltage sensor for sensing fuel cell or fuel cell stack voltage;
- further including a current sensor for sensing current flow through the fuel cell or fuel cell stack, and in which the controller is adapted to control water injection rate.

As such, the subject-matter of claims 1-4, 9-12 and 15-19 and 21-26 is disclosed by document D1 and is therefore considered to lack novelty.

3.3) Documents D2 (paragraph 36), D3 (paragraph 17; claims 1-19), D4 (paragraph 32;33)



and D5 (page, paragraph 3 - page 8, paragraph 4) further each anticipate the subject-matter of claims 1, 4, 9-12, 15-19 and 21-26.

**4) INVENTIVE STEP:**

The document D1 is regarded as being the closest prior art to the subject-matter of dependent claims 5-8, 13, 14, 20 and 27. Dependent claims 5-8, 13, 14, 20 and 27 do not appear to contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step (Article 33(2) and (3) PCT).

It appears to be a obvious technical measure known in the prior art (see e.g. document D6) to decrease the humidification during start or stop of the fuel cell (dependent claims 13, 14 and 27) in order to avoid e.g. flooding of the fuel cell.

The features of dependent claims 5-8 and 20 come within the scope of the customary optimization procedures which would be followed by persons skilled in the art since the features of dependent claims 5-8 and 20 reside in the choice of a particular range of parameters from a limited range of possibilities and since this range of the parameters could be arrived at by routine trial and error or by the application of normal design procedures.